ARS and Russian Scientists Develop "AgroAtlas" With Worldwide Benefits

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AgroAtlas provides maps, photos, and descriptions of crops such as wheat (shown above) and important diseases, insect pests, and weeds that affect production.

AgroAtlas, an interactive Russian/English website (**www.agroatlas.ru**) created by a team of Russian scientists backed by the Agricultural Research Service, shows the geographic distributions of 100 crops; 640 species of crop diseases, pests, and weeds; and 560 wild crop relatives growing in Russia and neighboring countries. The atlas also includes 200 maps that illustrate the environmental variables that affect crop production in that part of the world. In addition to the maps, the Internet-based atlas provides free geographic information system (GIS) software and offers color photos and a wealth of useful information about each species.

Although maps and information can be printed individually, once the free GIS software and atlas data are downloaded, users can build layers of information to, for example, determine the locations of the heaviest concentrations of insect pests, like Russian wheat aphids, in relation to the geographic distribution of wheat in the former Soviet Union.

"The ability to layer information from such a comprehensive atlas enables researchers to answer a huge array of agricultural questions," says Stephanie Greene, an ARS plant geneticist who leads the AgroAtlas project with Alexandr N. Afonin, a senior scientist with St. Petersburg State University-St. Petersburg.

"For example, when we demonstrated AgroAtlas in Crimea, a major wine-producing region, we showed where along its coast U.S. wine grapes can be successfully grown," says Greene. "In Petrozavodsk, a group that coordinates activities for more than 70 Russian botanical gardens was excited to see how the atlas and GIS software can be used to support plant-introduction activities. In the North Caucasus region, they were interested in using the atlas to understand the distribution of major wheat diseases according to agroclimatic zones."

An Idea Takes Shape

AgroAtlas is the successful result of a proposal that Greene and Afonin submitted in 2003 for funding under a program coordinated by ARS's Office of International Research Programs (OIRP) in Beltsville, Maryland, with funds from the U.S. Department of State. Known officially as the "Interactive Agricultural Ecological Atlas of Russia and Neighboring Countries," AgroAtlas is administered by the International Science and Technology Center, an intergovernmental organization headquartered in Moscow and comprising 13 member countries, including the United States.

Portions of AgroAtlas are managed by Nikolay I. Dzyubenko, with the N.I. Vavilov All-Russian Institute of Plant Industry in St. Petersburg; and by Andrei N. Frolov, with the All-Russian Institute of Plant Protection, Pushkin. To date, more than 60 scientists from 3 Russian research institutes have contributed their knowledge and time to the 7-year project.

"The impetus behind developing AgroAtlas was to promote food security, particularly in the NIS (Newly Independent States) countries, which are challenged with broadening their agricultural base after the Soviet years," says Greene, who is with ARS's Plant Germplasm Introduction and Testing in Prosser, Washington. "We wanted to bring together a wealth of agricultural information in a format that was useful to scientists, policymakers, and farmers and to provide tools that would enable the information to be combined and analyzed so it could support agricultural decisionmaking."

In September 2010, Greene and Afonin collaborated with their colleagues to host the first of a series of 10-day workshops in St. Petersburg to teach the use of AgroAtlas's GIS software to scientists and students from former Soviet states. In addition, OIRP awarded scholarships to support travel and lodging expenses for 20 students who learned about GIS using the AgroAtlas software. They were then to return to their institutes to train others. To receive university certificates, students also completed a research project using

AgroAtlas GIS. Sometime in summer 2011, the students with the best projects will publish their research results in *BioGIS,* a new, peer-reviewed journal that will be accessible from the AgroAtlas website.

Global Uses

The bilingual atlas is also generating interest in the United States and other countries. Greene says an official with USDA's Animal and Plant Health Inspection Service who contacted her about AgroAtlas remarked on its potential to aid in detecting and identifying species of insect pests, disease organisms, or weeds that have entered—or could enter—the United States from Russia or neighboring countries.

The USDA Cooperative Agricultural Pest Survey program has also used AgroAtlas in developing the Grape Commodity Survey Reference Data Sheet. There have been requests from the United Kingdom and India to use images of various species in other publications. A scientist in the United Kingdom found the information on black currants valuable in writing a global review on black currant production, markets, and products, Greene adds.

On another front, AgroAtlas maps of climate, environmental, and other data could be integrated with computer models to assess the potential impact of global climate change on the future distribution of crops, pests, and crop wild relatives, particularly in the former Soviet Union. Another potential application is improved conservation of genetic resources.

According to Greene, no other resource gathers together the geographic distribution of the many native crop wild relatives that are found in Eastern Europe and central Asia. Although the atlas has only recently been published, the website receives more than 30,000 hits per month, she reports.

The project, while drawing to a close, has forged stronger personal and professional ties—both among Russian scientists and colleagues in other countries, all of which bodes well for future collaborations. "Because AgroAtlas showcases the work of such a diverse array of Russian scientists, it's a great place to identify potential collaborators. And international partnerships promote global food security," says Greene.—By **Jan Suszkiw,** ARS.

This research supports the USDA priority of promoting international food security and is part of Plant Genetic Resources, Genomics, and Genetic Improvement, an ARS national program (#301) described at www.nps.ars.usda.gov.

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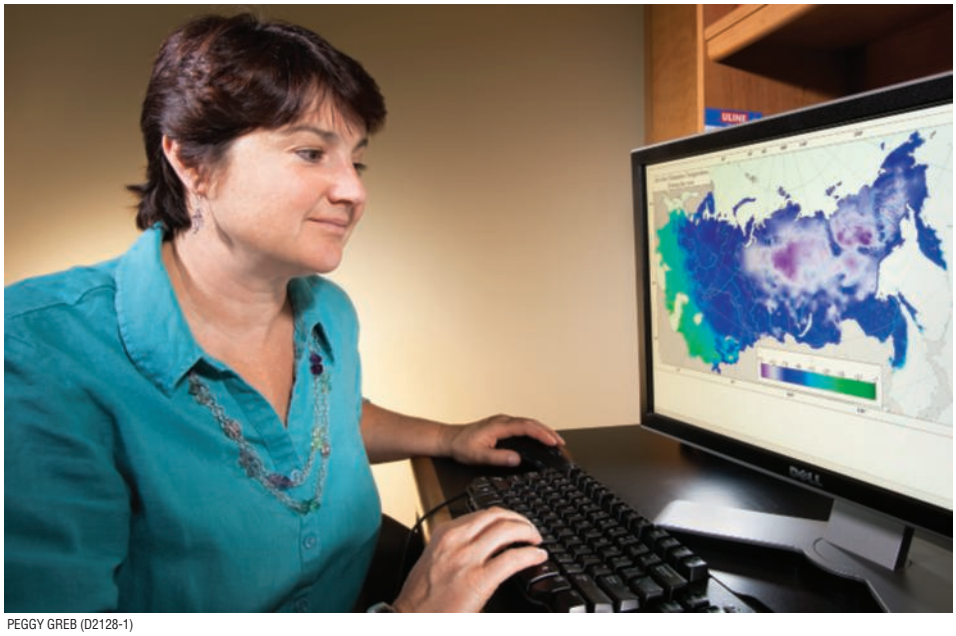
Tamara Smekalova (right), head of the Agrobotany Department, shows Stephanie Greene, ARS plant geneticist, herbarium specimens at the N.I. Vavilov Institute of Plant Industry in St. Petersburg, Russia. For the AgroAtlas project, scientists at the Vavilov Institute used herbarium specimens to help describe and pinpoint where crops and wild relative species grow throughout the area of the former Soviet Union.

Plant geneticist Stephanie Greene examines a digital map of absolute minimal temperature. AgroAtlas contains 1,500 maps that illustrate the distribution of crops, wild crop relatives, diseases, pests, weeds, and more. Maps are in an open-source geographic information system format and can be downloaded from the AgroAtlas website.



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